

What is claimed is:

1. An object detection apparatus for detecting a target object in an image, comprising:

5       a template memory portion for memorizing a template consisting of one or more open curves indicating a part of a contour of a model of the object or a part of the model;

      an image input portion for entering an image to be detected; and

10       a detection portion for detecting the object in the entered image by calculating a matching degree of the entered image with the template.

2. The object detection apparatus according to claim 1, further comprising:

15       an edge image generation portion for generating an edge image of the entered image, wherein

      the detection portion detects the object by calculating the matching degree in accordance with the number of pixels in an overlapping area of an edge of the edge image with the one or more open curves of the  
20       template when overlapping the template with each position of the edge image of the entered image.

3. The object detection apparatus according to claim 1, further comprising:

25       an edge image generation portion for generating an edge image of the entered image;

      an overlapping portion for overlapping the generated edge image with the template; and

      a count portion for counting the number of times of  
30       overlapping of the template with the one or more open

curves for each pixel in the edge image when the overlapping portion performed the overlapping process for each pixel on an edge of the edge image, wherein

the template memory portion has a template that is  
5 made of one or more open curves indicating a part of a contour of a model of the object or a part of the model and a point indicating a predetermined position of the model, and is made by rotating the one or more open curves around the point by a half-turn,

10 the overlapping portion overlaps the edge image with the template so that a pixel on the edge of the edge image matches the point of the template, and

the detection portion detects the object by calculating the matching degree in accordance with the  
15 number of times counted by the count portion.

4. The object detection apparatus according to claim 1, further comprising:

a brightness image generation portion for generating a brightness image of the entered image; and

20 an average brightness calculation portion for calculating an average brightness of an image area of the generated brightness image, wherein

the template memory portion memorizes a template consisting of one or more open curves indicating a part of  
25 a contour of a model of the object or a part of the model and a plurality of areas sandwiching the one or more open curves,

the average brightness calculation portion calculates an average brightness of each image area of the  
30 brightness image overlapping the plural areas of the

template when overlapping the template with each position of the generated brightness image, and

the detection portion detects the object by calculating the matching degree in accordance with the  
5 average brightness of each of the image areas of the brightness image that was calculated by the average brightness calculation portion.

5. The object detection apparatus according to claim 1, wherein

10 the object is a person, and  
the open curve constituting the template is a contour of an upper half of a human head.

6. The object detection apparatus according to claim 1, wherein

15 the object is a person, and  
the open curves constituting the template are contours of human shoulders.

7. An object detection method for detecting a target object in an image, comprising:

20 a step for entering an image to be detected; and  
a step for detecting the object in the entered image by calculating a matching degree of the entered image with a template consisting of one or more open curves indicating a part of a contour of a model of the object or  
25 a part of the model.

8. The object detection method according to claim 7, further comprising:

a step for generating an edge image of the entered image, wherein  
30 the step for detecting includes detecting the object

by calculating the matching degree in accordance with the number of pixels in an overlapping area of an edge of the edge image with the one or more open curves of the template when overlapping the template with each position  
5 of the edge image of the entered image.

9. The object detection method according to claim 7, further comprising:

a step for generating an edge image of the entered image;

10 a step for overlapping the generated edge image with the template; and

a step for counting the number of times of overlapping of the template with the one or more open curves for each pixel in the edge image when performing  
15 the overlapping process for each pixel on an edge of the edge image, wherein

the template is a template that is made of one or more open curves indicating a part of a contour of a model of the object or a part of the model and a point  
20 indicating a predetermined position of the model, and is made by rotating the one or more open curves around the point by a half-turn,

the step for overlapping includes overlapping the edge image with the template so that a pixel on the edge  
25 of the edge image matches the point of the template, and

the step for detecting includes detecting the object by calculating the matching degree in accordance with the number of times counted in the step for counting.

10. The object detection method according to claim  
30 7, further comprising:

a step for generating a brightness image of the entered image; and

a step for calculating an average brightness in an image area of the generated brightness image, wherein

5 the template is a template that is made of one or more open curves indicating a part of a contour of a model of the object or a part of the model and a plurality of areas sandwiching the one or more open curves,

the step for calculating an average brightness  
10 includes calculating an average brightness of each image area of the brightness image overlapping the plural areas of the template when overlapping the template with each position of the generated brightness image, and

the step for detecting includes detecting the object  
15 by calculating the matching degree in accordance with the calculated average brightness of each of the image areas of the brightness image.

11. The object detection method according to claim 7, wherein

20 the object is a person, and

the open curve constituting the template is a contour of an upper half of a human head.

12. The object detection method according to claim 7, wherein

25 the object is a person, and

the open curves constituting the template are contours of human shoulders.

13. A recording medium that is used for calculating a matching degree in an image and for recording a template  
30 consisting of one or more open curves indicating a part of

a contour of a model of an object or a part of the model.

14. The recording medium according to claim 13,  
wherein

the object is a person, and

5 the open curve constituting the template is a  
contour of an upper half of a human head.

15. The recording medium according to claim 13,  
wherein

the object is a person, and

10 the open curves constituting the template are  
contours of human shoulders.

16. A monitoring system, comprising:

a video camera for taking an image; and

an object detection apparatus for detecting a target  
15 object in the image taken by the video camera, wherein  
the object detection apparatus includes

a template memory portion for memorizing a  
template consisting one or more open curves indicating a  
part of a contour of a model of the object or a part of  
20 the model, and

a detection portion for detecting the object  
in the image by calculating a matching degree of the image  
taken by the video camera with the template.

17. The monitoring system according to claim 16,  
25 further comprising:

an image display device for displaying an enlarged  
image area of the object detected by the object detection  
apparatus among the image taken by the video camera.

18. The monitoring system according to claim 16,  
30 further comprising:

a recording device for recording an image taken by the video camera when the object is detected in the image.

19. The monitoring system according to claim 16, wherein

5           the object is a person, and  
            the open curve constituting the template is a contour of an upper half of a human head.

20. The monitoring system according to claim 16, wherein

10           the object is a person, and  
            the open curves constituting the template are contours of human shoulders.